In the Claims

1-20. (Cancelled)

21. (Previously presented) A method of execution by a computer to represent an MDS (multidimensional scaling) space as a hierarchical data structure, the MDS space defined by a set of points that correspond to a set of objects, wherein distances between pairs of points in the MDS space represent attribute proximities for the corresponding pairs of objects, the hierarchical data structure searchable to identify objects with similar attributes, the method comprising:

creating a root node comprising coordinates in the MDS space for a first subset of the set of points selected based on the distances between pairs of points, the root node further comprising boundary information in the MDS space for local MDS spaces defined by further subsets of the set of points, the MDS space defined by running MDS on the first subset of points; and

creating a plurality of leaf nodes, each leaf node comprising coordinates in a local MDS space for the points in one of the further subsets, wherein creating a plurality of leaf nodes comprises iteratively grouping the points remaining after selecting the first subset into the further subsets based on coordinates in the MDS space of the remaining points and running MDS on the further subsets to define the local MDS spaces.

22. (Cancelled)

23. (Previously presented) The method of claim 21, wherein the largest distance between a pair of points is used as base criteria for selecting points for the first subset.

24-25. (Cancelled)

26. (Previously presented) The method of claim 21, wherein the points are grouped using a median cut algorithm.

27. (Previously presented) The method of claim 21, wherein the coordinates of the remaining points are calculated using a single node update process.

28. (Cancelled)

29. (Previously Presented) The method of claim 21, wherein each node further comprises a map relating distances between pairs of points in the associated MDS space with the attribute proximities between the corresponding objects.

30. (Previously Presented) The method of claim 21, wherein the leaf nodes further comprise coordinates for any overlapping portions of the associated local MDS spaces.

31. (Previously Presented) The method of claim 21 further comprising:
        identifying a node for a new point corresponding to a new object based on attribute proximities between the new object and existing objects.

32. (Previously Presented) The method of claim 31 further comprising:
        adding the new point into the subset associated with the identified node; and
        redefining the local MDS space for the identified node.

33. (Previously Presented) The method of claim 32, wherein adding the new point comprises:
        calculating coordinates of the new point using a single node update process.

34. (Previously Presented) The method of claim 32, wherein redefining the local MDS space comprises:
        running MDS on the subset associated with the identified node.

35. (Previously Presented) The method of claim 32 further comprising:
        recalculating the boundary information in the root node for the local MDS space for the identified node.

36. (Previously Presented) The method of claim 32 further comprising:

    redefining the local MDS space for a traversed node, the traversed node located between the root node and the identified node; and

    recalculating the boundary information in the root node for the local MDS space for the traversed node.

37. (Previously Presented) The method of claim 32 further comprising:

    redefining the MDS space for the root node; and

    recalculating the boundary information in the root node for the local MDS spaces.

38. (Previously Presented) The method of claim 31 further comprising:

    determining points in the subset associated with the identified node that are within a pre-determined distance of the new point.

39. (Previously Presented) The method of claim 38 further comprising:

    determining points in the subset associated with a traversed node that are within the pre-determined distance of the new point, the traversed node located between the root node and the identified node.

40. (Previously presented) A method of execution by a computer to query a hierarchical data structure to identify objects with similar attributes, the hierarchical data structure comprising root and leaf nodes representing an MDS (multidimensional scaling) space defined by a set of points that correspond to a set of objects, wherein distances between pairs of points in the MDS space represent attribute proximities for the corresponding pairs of objects, the root node comprises coordinates in the MDS space for a first subset of the set of points and boundary information in the MDS space for local MDS spaces defined by further subsets of the set of points, and each leaf node comprises coordinates in a local MDS space for the points in one of the further subsets, the method comprising:

    identifying a node for a new point corresponding to a new object based on attribute proximities between the new object and existing objects;

adding the new point into the subset associated with the identified node;

redefining the local MDS space for the identified node by running MDS on the subset associated with the identified node; and

recalculating the boundary information in the root node for the local MDS space for the identified node.

41. (Cancelled)

42. (Previously Presented) The method of claim 40, wherein adding the new point comprises:

calculating coordinates of the new point using a single node update process.

43-44. (Cancelled)

45. (Previously Presented) The method of claim 40 further comprising:

redefining the local MDS space for a traversed node, the traversed node located between the root node and the identified node; and

recalculating the boundary information in the root node for the local MDS space for the traversed node.

46. (Previously Presented) The method of claim 40 further comprising:

redefining the MDS space for the root node; and

recalculating the boundary information in the root node for the local MDS spaces.

47. (Previously Presented) The method of claim 40 further comprising:

determining points in the subset associated with the identified node that are within a pre-determined distance of the new point.

48. (Previously Presented) The method of claim 47 further comprising:

determining points in the subset associated with a traversed node that are within the pre-determined distance of the new point, the traversed node located between the root node and the identified node.

49. (Previously presented) A computer readable storage medium having executable instructions to cause a processor to perform a method of representing an MDS (multidimensional scaling) space as a hierarchical data structure, the MDS space defined by a set of points that correspond to a set of objects, wherein distances between pairs of points in the MDS space represent attribute proximities for the corresponding pairs of objects, the hierarchical data structure searchable to identify objects with similar attributes, the method comprising:

creating a root node comprising coordinates in the MDS space for a first subset of the set of points selected based on the distances between pairs of points, the root node further comprising boundary information in the MDS space for local MDS spaces defined by further subsets of the set of points, the MDS space defined by running MDS on the first subset of points; and

creating a plurality of leaf nodes, each leaf node comprising coordinates in a local MDS space for the points in one of the further subsets, wherein creating a plurality of leaf nodes comprises iteratively grouping the points remaining after selecting the first subset into the further subsets based on coordinates in the MDS space of the remaining points and running MDS on the further subsets to define the local MDS spaces.

50. (Cancelled)

51. (Previously presented) The computer readable storage medium of claim 49, wherein the largest distance between a pair of points is used as base criteria for selecting points for the first subset.

52-53. (Cancelled)

54. (Previously presented) The computer readable storage medium of claim 49, wherein the points are grouped using a median cut algorithm.

55. (Previously presented)The computer readable storage medium of claim 49, wherein the coordinates of the remaining points are calculated using a single node update process.

56. (Cancelled)

57. (Previously presented) The computer readable storage medium of claim 49, wherein each node further comprises a map relating distances between pairs of points in the associated MDS space with the attribute proximities between the corresponding objects.

58. (Previously presented) The computer readable storage medium of claim 49, wherein the leaf nodes further comprise coordinates for any overlapping portions of the associated local MDS spaces.

59. (Previously presented) The computer readable storage medium of claim 49, wherein the method further comprises:

identifying a node for a new point corresponding to a new object based on attribute proximities between the new object and existing objects.

60. (Previously presented) The computer readable storage medium of claim 59, wherein the method further comprises:

adding the new point into the subset associated with the identified node; and
redefining the local MDS space for the identified node.

61. (Previously presented) The computer readable storage medium of claim 60, wherein adding the new point comprises:

calculating coordinates of the new point using a single node update process.

62. (Previously presented) The computer readable storage medium of claim 60, wherein redefining the local MDS space comprises:

running MDS on the subset associated with the identified node.

63. (Previously presented) The computer readable storage medium of claim 60, wherein the method further comprises:

recalculating the boundary information in the root node for the local MDS space for the identified node.

64. (Previously presented) The computer readable storage medium of claim 60, wherein the method further comprises:

redefining the local MDS space for a traversed node, the traversed node located between the root node and the identified node; and

recalculating the boundary information in the root node for the local MDS space for the traversed node.

65. (Previously presented) The computer readable storage medium of claim 60, wherein the method further comprises:

redefining the MDS space for the root node; and

recalculating the boundary information in the root node for the local MDS spaces.

66. (Previously presented) The computer readable storage medium of claim 59, wherein the method further comprises:

determining points in the subset associated with the identified node that are within a pre-determined distance of the new point.

67. (Previously presented) The computer readable storage medium of claim 66, wherein the method further comprises:

determining points in the subset associated with a traversed node that are within the pre-determined distance of the new point, the traversed node located between the root node and the identified node.

68. (Previously presented) A computer readable storage medium having executable instructions to cause a processor to perform a method of querying a hierarchical data structure to identify objects having similar attributes, the hierarchical data structure comprising root and leaf nodes representing an MDS (multidimensional scaling) space defined by a set of points that correspond to a set of objects, wherein distances between pairs of points in the MDS space represent attribute proximities for the corresponding pairs of objects, the root node comprises coordinates in the MDS space for a first subset of the set of points and boundary information in the MDS space for local MDS spaces defined by further subsets of the set of points, and each leaf node comprises coordinates in a local MDS space for the points in one of the further subsets, the method comprising:

identifying a node for a new point corresponding to a new object based on attribute proximities between the new object and existing objects

adding the new point into the subset associated with the identified node;

redefining the local MDS space for the identified node by running MDS on the subset associated with the identified node; and

recalculating the boundary information in the root node for the local MDS space for the identified node.

69. (Cancelled)

70. (Previously presented) The computer readable storage medium of claim 68, wherein adding the new point comprises:

calculating coordinates of the new point using a single node update process.

71-72. (Cancelled)

73. (Previously presented) The computer readable storage medium of claim 68, wherein the method further comprises:

redefining the local MDS space for a traversed node, the traversed node located between the root node and the identified node; and

recalculating the boundary information in the root node for the local MDS space for the traversed node.

74. (Previously presented) The computer readable storage medium of claim 68, wherein the method further comprises:

    redefining the MDS space for the root node; and

    recalculating the boundary information in the root node for the local MDS spaces.

75. (Previously presented) The computer readable storage medium of claim 68, wherein the method further comprises:

    determining points in the subset associated with the identified node that are within a pre-determined distance of the new point.

76. (Previously presented) The computer readable storage medium of claim 75, wherein the method further comprises:

    determining points in the subset associated with a traversed node that are within the pre-determined distance of the new point, the traversed node located between the root node and the identified node.

77. (Previously presented) A computer system comprising:

    a processor coupled to a memory through a bus; and

    a process executed from the memory by the processor to cause the processor to represent an MDS (multidimensional scaling) space as a hierarchical data structure by creating a root node and a plurality of leaf nodes, the root node comprising coordinates in the MDS space for a first subset of a set of points selected based on the distances between pairs of points, the first subset of points defining the MDS space, the root node further comprising boundary information in the MDS space for local MDS spaces defined by further subsets of the set of points, the MDS space defined by running MDS on the first subset of points, and each leaf node comprising coordinates in a local MDS space for the points in one of the further subsets, wherein the process further causes the processor to iteratively group the points remaining after selecting the first subset into the further

subsets based on coordinates in the MDS space of the remaining points to create the plurality of leaf nodes and to run MDS on the further subsets to define the local MDS spaces, wherein the set of points correspond to a set of objects, and distances between pairs of points in the MDS space represent attribute proximities for the corresponding pairs of objects, wherein the hierarchical data structure is searchable to identify objects with similar attributes.

78. (Cancelled)

79. (Previously presented) The system of claim 77, wherein the largest distance between a pair of points is used as base criteria for selecting points for the first subset.

80-81. (Cancelled)

82. (Previously presented) The system of claim 77, wherein the points are grouped using a median cut algorithm.

83. (Previously presented) The system of claim 77, wherein the coordinates of the remaining points are calculated using a single node update process.

84. (Cancelled)

85. (Previously Presented) The system of claim 77, wherein each node further comprises a map relating distances between pairs of points in the associated MDS space with the attribute proximities between the corresponding objects.

86. (Previously Presented) The system of claim 77, wherein the leaf nodes further comprise coordinates for any overlapping portions of the associated local MDS spaces.

87. (Previously Presented) The system of claim 77, wherein the process further causes the processor to identify a node for a new point corresponding to a new object based on attribute proximities between the new object and existing objects.

88. (Previously Presented) The system of claim 87, wherein the process further causes the processor to add the new point into the subset associated with the identified node, and redefine the local MDS space for the identified node.

89. (Previously Presented) The system of claim 88, wherein the process further causes the processor to calculate coordinates of the new point using a single node update process to add the new point.

90. (Previously Presented) The system of claim 88, wherein the process further causes the processor to run MDS on the subset associated with the identified node to redefine the local MDS space.

91. (Previously Presented) The system of claim 88, wherein the process further causes the processor to recalculate the boundary information in the root node for the local MDS space for the identified node.

92. (Previously Presented) The system of claim 88, wherein the process further causes the processor to redefine the local MDS space for a traversed node, the traversed node located between the root node and the identified node, and recalculate the boundary information in the root node for the local MDS space for the traversed node.

93. (Previously Presented) The system of claim 88, wherein the process further causes the processor to redefine the MDS space for the root node, and recalculate the boundary information in the root node for the local MDS spaces.

94. (Previously Presented) The system of claim 87, wherein the process further causes the processor to determine points in the subset associated with the identified node that are within a pre-determined distance of the new point.

95. (Previously Presented) The system of claim 94, wherein the process further causes the processor to determine points in the subset associated with a traversed node that are within the pre-determined distance of the new point, the traversed node located between the root node and the identified node.

96. (Previously presented) A computer system comprising:

a processor coupled to a memory through a bus;

a process executed from the memory by the processor to cause the processor to query a hierarchical data structure to identify objects having similar attributes, the hierarchical data structure comprising root and leaf nodes representing an MDS (multidimensional scaling) space, by identifying a node for a new point corresponding to a new object based on attribute proximities between the new object and existing objects, by adding the new point into the subset associated with the identified node, by redefining a local MDS space for the identified node by running MDS on the subset associated with the identified node, wherein the MDS space is defined by a set of points that correspond to a set of objects, distances between pairs of points in the MDS space represent attribute proximities for the corresponding pairs of objects, the root node comprises coordinates in the MDS space for a first subset of the set of points and boundary information in the MDS space for the local MDS spaces defined by further subsets of the set of points, and each leaf node comprises coordinates in the local MDS space for the points in one of the further subsets, and by recalculating the boundary information in the root node for the local MDS space for the identified node.

97. (Cancelled)

98. (Previously Presented) The system of claim 96, wherein the process further causes the processor to calculate coordinates of the new point using a single node update process to add the new point.

99-100. (Cancelled)

101. (Previously Presented) The system of claim 96, wherein the process further causes the processor to redefine the local MDS space for a traversed node, the traversed node located between the root node and the identified node, and recalculate the boundary information in the root node for the local MDS space for the traversed node.

102. (Previously Presented) The system of claim 96, wherein the process further causes the processor to redefine the MDS space for the root node, and recalculate the boundary information in the root node for the local MDS spaces.

103. (Previously Presented) The system of claim 96, wherein the process further causes the processor to determine points in the subset associated with the identified node that are within a pre-determined distance of the new point.

104. (Previously Presented) The system of claim 103, wherein the process further causes the processor to determine points in the subset associated with a traversed node that are within the pre-determined distance of the new point, the traversed node located between the root node and the identified node.

105-132. (Cancelled)